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(54) **INTELLIGENT CAR LAMPLIGHT CONTROL DEVICE**

(57) The invention relates to an intelligent car lamplight control device comprising an ambient light intensity sensor, a speed sensor, a main control MCU, a wireless transmitter, a lamplight main-control system, wherein the ambient light intensity sensor is used to automatically monitor the light intensity outside a car; the speed sensor is used to detect the driving speed of the car; the main control MCU is used to acquire a light intensity signal transmitted from the ambient light intensity sensor and a speed signal transmitted from the speed sensor; the wireless transmitter is used to wirelessly transmit a control command transmitted from the main control MCU to the lamplight main-control system; and the lamplight main-control system is used to receive the control command transmitted from the wireless transmitter and to correspondingly control lamplight according to the control command. The invention also relates to an intelligent car lamplight control device comprising a sensor acquisition module and a car lamp control module in wireless communication with the sensor acquisition module, wherein the sensor acquisition module includes a rain-fog detection sensor circuit, an ambient light intensity sensor circuit, a speed sensor circuit, a wireless transmitting circuit, and a data processing circuit; the car lamp control module includes a yellow-white lamp PWM control circuit, a wireless receiving circuit, and a lamplight main-control circuit.

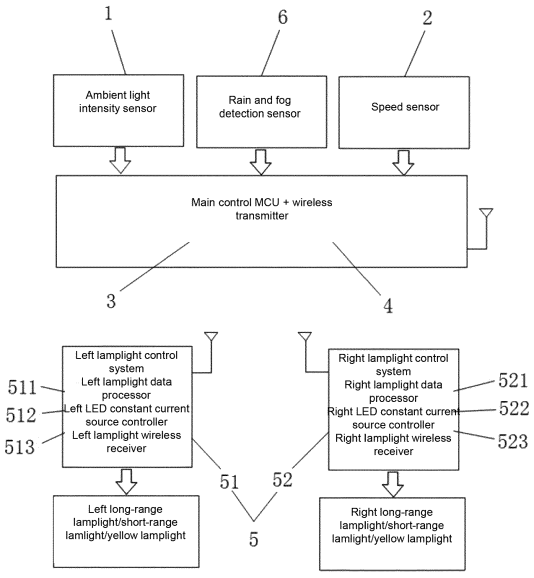


Fig.1

EP 3 852 499 A1

Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to the technical field of intelligent control over cars, in particular to an intelligent car lamplight control device. The present invention also relates to the technical field of cars.

2. Description of Related Art

[0002] With the continuous development and progress of society, cars have become common vehicles in people's daily life. Existing car lamps are controlled manually. Many people may neglect the importance of using the lamps properly during driving. In a case where drivers forget changing a high beam to a low beam when meeting a car from the opposite direction at night or leaving from highways, violations will happen, and potential safety hazards will be caused, which is no good to ourselves and others.

BRIEF SUMMARY OF THE INVENTION

[0003] The objective of the present invention is to overcome the above defects of the prior art by providing an intelligent car lamplight control device.

[0004] To fulfill the above-mentioned objective, the present invention provides an intelligent car lamplight control device, which comprises:

An ambient light intensity sensor used to automatically monitor the intensity outside a car;

A speed sensor used to detect the driving speed of the car;

A main control MCU used to acquire a light intensity signal transmitted from the ambient light intensity sensor and a speed signal transmitted from the speed sensor, wherein when determining, by analysis, that a light intensity value in the light intensity signal transmitted from the ambient light intensity sensor is less than a preset value or is changed to be small from being large and then alternately changed between a large value and a small value, the main control MCU transmits a car lamp on-off control command to a lamplight main-control system through a wireless transmitter to control the lamplight main-control system to turn on a car lamp; when acquiring that a speed value in the speed signal transmitted from the speed sensor is greater than a present value, the main control MCU transmits a high/low beam switching control command to the lamplight main-control system through the wireless transmitter to control the lamplight main-control system to switch a low beam to a high beam; and when determining, by analysis, that the light intensity value in the light intensity signal transmitted from the ambient light intensity sensor is changed to be large from being small or is alternately changed between a large value and a small value and that an average driving speed is changed to be low from being high, the main control MCU transmits a high/low beam switching control command to the lamplight main-control system through the wireless transmitter to control the lamplight main-control system to switch the high beam to the low beam;

The wireless transmitter used to wirelessly transmit the control commands transmitted from the main control MCU to the lamplight main-control system; and

The lamplight main-control system used to receive the control commands transmitted from the wireless transmitter and to correspondingly control lamplight according to the control commands;

Wherein, the main control MCU has an analog input terminal electrically connected to the ambient light intensity sensor as well as an 12C communication port electrically connected to the speed sensor, and the wireless transmitter is electrically connected to the main control MCU and is wirelessly connected to the lamplight main-control system.

[0005] Preferably, the ambient light intensity sensor includes a photosensitive diode capable of converting an induced light intensity into a voltage signal.

[0006] Preferably, the intelligent car lamplight control device further comprises a rain-fog detection sensor used to automatically monitor the rain-fog state in an ambient environment and electrically connected to a digital input terminal of the main control MCU, wherein two parallel and spaced metal sheets are arranged on the rain-fog detection sensor; one metal sheet is electrified, and when water is condensed between the two metal sheets, the two metal sheets will be conductive with each other to cause a voltage change in the rain-fog detection sensor; the rain-fog detection sensor can transmit a rain-fog state signal to the main control MCU after detecting the voltage change; and the main control MCU transmits a lamplight color switching control command to the lamplight main-control system through the wireless transmitter to control the lamplight main-control system to switch white lamplight to yellow lamplight.

[0007] Preferably, the speed sensor includes a 3D acceleration sensor IC capable of detecting a gradient of a road where the car drives; and when determining, by analysis, that a gradient value of the driving road in a gradient signal transmitted from the speed sensor is greater than a preset value, the main control MCU transmits an angle adjustment control command to the lamp-

light main-control system through the wireless transmitter to control the lamplight main-control system to adjust a lamplight irradiation angle.

[0008] Preferably, the wireless transmitter transmits data by means of a communication frequency band at a wireless common frequency of 315MHz-470MHz.

[0009] Preferably, the lamplight main-control system includes a left lamplight control system and a right lamplight control system which are in wireless transmission connection with the wireless transmitter.

[0010] Preferably, the left lamplight control system includes a left lamplight data processor, a left LED constant current source controller, and a left lamplight wireless receiver, wherein the left lamplight data processor is electrically connected to the left lamplight wireless receiver and the left LED constant current source controller, and the left lamplight wireless receiver is in wireless transmission connection with the wireless transmitter.

[0011] Preferably, the right lamplight control system includes a right lamplight data processor, a right LED constant current source controller, and a right lamplight wireless receiver, wherein the right lamplight data processor is electrically connected to the right lamplight wireless receiver and the right LED constant current source controller, and the right lamplight wireless receiver is in wireless transmission connection with the wireless transmitter.

[0012] Preferably, the main control MCU is able to simulate a light intensity value of the car lamp by means of a digital-to-analog conversion circuit arranged in the main control MCU and compare the light intensity value with the light intensity value in the light intensity signal transmitted from the ambient light intensity sensor.

[0013] The invention fulfills intelligent control over a car lamp and can correctly use a high beam and a low beam to avoid violations or traffic accidents caused by improper use of the lamp, thus guaranteeing the safety and reliability.

[0014] Compared with the prior art, the present invention has the following beneficial effects:

1. The present invention can monitor the light intensity in the ambient environment of the car and the car speed in real time to correspondingly control the car lamp according to these state data, and can correctly use the high beam and the low beam to fulfill intelligent control over the car lamp, thus avoiding violations or traffic accidents caused by improper use of the lamp and guaranteeing the safety and reliability.

2. The present invention can change the color of the car lamp according to the rain-fog state, detected by the rain-fog detection sensor, in the ambient environment of the car and can change the irradiation angle of the car lamp according to the gradient, detected by the speed sensor, of the driving road, thus providing a safe driving condition for drivers and being practical.

[0015] The invention further provides an intelligent car lamplight control device, which comprises a sensor acquisition module and a car lamp control module in wireless communication with the sensor acquisition module, wherein the sensor acquisition module includes a rain-fog detection sensor circuit, an ambient light intensity sensor circuit, a speed sensor circuit, a wireless transmitting circuit, and a data processing circuit electrically connected to the rain-fog detection sensor circuit, the ambient light intensity sensor circuit, the speed sensor circuit, and the wireless transmitting circuit; and the car lamp control module includes a yellow-white lamp PWM control circuit, a wireless receiving circuit, and a lamplight main-control circuit electrically connected to the yellow-white lamp PWM control circuit and the wireless receiving circuit.

[0016] Preferably, a rain-fog detection sensor of the rain-fog detection sensor circuit includes two parallel metal sheets spaced apart from each other by 1mm-2mm; and one metal sheet has a positive voltage applied thereto, and the other metal sheet is connected to an MCU of the data processing circuit.

[0017] Preferably, the two metal sheets are perpendicular to a driving direction.

[0018] Preferably, a photosensitive diode is used as a light intensity data acquisition device of the ambient light intensity sensor circuit; and when light changes, a light intensity induced by the photosensitive diode is converted into a variable voltage signal input to the MCU of the data processing circuit.

[0019] Preferably, the speed sensor circuit is provided with a 3D acceleration sensor chip, and the MCU of the data processing circuit reads data from the 3D acceleration sensor chip via a communication port of the MCU.

[0020] Preferably, the wireless transmitting circuit transmits data by means of a communication frequency band at a wireless common frequency of 315MHz-470MHz.

[0021] Preferably, the sensor acquisition module further includes a first polarity protection circuit and a first voltage stabilizing circuit electrically connected to the first polarity protection circuit, the rain-fog detection sensor circuit, the ambient light intensity sensor circuit, the speed sensor circuit, the wireless transmitting circuit, and the data processing circuit.

[0022] Preferably, the car lamp control module further includes a second polarity protection circuit, a second voltage stabilizing circuit, and a constant-current and constant-voltage circuit, wherein the second polarity protection circuit is electrically connected to the second voltage stabilizing circuit and the constant-current and constant-voltage circuit; the second voltage stabilizing circuit is electrically connected to the wireless receiving circuit and the lamplight main-control circuit; and the constant-current and constant-voltage circuit is electrically connected to the yellow-white lamp PWM control circuit.

[0023] Compared with the prior art, the invention has the following beneficial effects:

[0024] According to the invention, the rain-fog detection sensor circuit can detect ambient rain-fog states, the ambient light intensity sensor circuit can detect a light intensity in an ambient environment, the speed sensor circuit can detect a car speed and a road gradient, the wireless transmitting circuit can wirelessly transmit the data to the car lamp control module, and the yellow-white lamp PWM control circuit switches long-range lamplight and short-range lamplight or switches white lamplight and yellow lamplight to provide a safe driving condition for drivers.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0025] For the sake of a clearer explanation of the technical solutions of the embodiments of the present invention or the prior art, a brief description of the accompanying drawings required by the embodiments or the prior art is given below. Clearly, the drawings in the following description are used for illustrating certain embodiments of the present invention, and those ordinarily skilled in the art can acquire other drawings according to the following ones without creative labor.

FIG. 1 is a circuit diagram of an intelligent car lamplight control device in an embodiment of the present invention;

FIG. 2 is a schematic diagram of a rain-fog detection sensor of the intelligent car lamplight control device in the embodiment of the present invention;

FIG. 3 is an assembly diagram of a photosensitive diode of the intelligent car lamplight control device in the embodiment of the present invention.

Fig. 4 is a structural block diagram of an intelligent car lamplight control device in an embodiment of the utility model;

FIG. 5 is a circuit block diagram of a sensor acquisition module in the embodiment of the utility model;

FIG. 6 is a schematic diagram of a data processing circuit in the embodiment of the utility model;

FIG. 7 is a schematic diagram of a rain-fog detection sensor circuit in the embodiment of the utility model;

FIG. 8 is a schematic diagram of an ambient light intensity sensor circuit in the embodiment of the utility model;

FIG. 9 is a schematic diagram of a speed sensor circuit in the embodiment of the utility model;

FIG. 10 is a schematic diagram of a wireless transmitting circuit in the embodiment of the utility model;

FIG. 11 is a schematic diagram of a first polarity protection circuit and a first voltage stabilizing circuit in the embodiment of the utility model;

FIG. 12 is a circuit block diagram of a car lamp control module in the embodiment of the utility model;

FIG. 13 is a schematic diagram of a lamplight main-control circuit in the embodiment of the utility model;

FIG. 14 is a schematic diagram of a yellow-white lamp PWM control circuit in the embodiment of the utility model;

FIG. 15 is a schematic diagram of a wireless receiving circuit in the embodiment of the utility model;

FIG. 16 is a schematic diagram of a second polarity protection circuit in the embodiment of the utility model;

FIG. 17 is a schematic diagram of a second voltage stabilizing circuit in the embodiment of the utility model;

FIG. 18 is a schematic diagram of a constant-current and constant-voltage circuit in the embodiment of the utility model.

DETAILED DESCRIPTION OF THE INVENTION

[0026] To gain a better understanding of the objectives, technical solutions, and advantages of the invention, the technical solutions of the embodiments of the invention are clearly and completely described below in combination with the accompanying drawings. Clearly, the embodiments in the following description are only illustrative ones, and are not all possible ones of the invention. All other embodiments obtained by those of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0027] Referring to FIG. 1 to FIG. 3, an embodiment of the present invention provides an intelligent car lamplight control device, which comprises an ambient light intensity sensor 1, a speed sensor 2, a main control MCU3, a wireless transmitter 4, a lamplight main-control system 5, and the like. All components of this embodiment are expounded below in conjunction with the accompanying drawings.

[0028] The ambient light intensity sensor 1 is used to automatically monitor the light intensity outside a car.

[0029] As shown in FIG. 3, the ambient light intensity sensor 1 includes a photosensitive diode 11 capable of converting an induced light intensity into a voltage signal.

[0030] The speed sensor 2 is used to detect a driving speed of the car.

[0031] Preferably, the speed sensor 2 includes a 3D acceleration sensor IC capable of detecting the driving speed of the car and the gradient of a driving road ; and when determining, by analysis, that a gradient value of the driving road in a gradient signal transmitted from the speed sensor 2 is greater than 15°, the main control MCU3 transmits an angle adjustment control command to the lamplight main-control system 5 through the wireless transmitter 4 to control the lamplight main-control system 5 to adjust a lamplight irradiation angle. Of course, in other embodiments, a reference value of the gradient of the driving road can be changed by users as actually needed, without being limited to this embodiment.

[0032] The main control MCU3 is used to acquire a light intensity signal transmitted from the ambient light intensity sensor 1 and speed and gradient signals transmitted from the speed sensor 2, and has an analog input terminal electrically connected to the ambient light intensity sensor 1 as well as an 12C communication port electrically connected to the speed sensor 2.

[0033] Wherein, during operation, the main control MCU3 is able to simulate a light intensity value of a car lamp by means of a digital-to-analog conversion circuit arranged in the main control MCU3 and compare the light intensity value with a light intensity value in the light intensity signal transmitted from the ambient light intensity sensor 1, thus preventing the intelligent car lamplight control device from misjudging the lamplight of the car as the ambient light when the lamplight emitted by the car lamp is reflected by a wall, which may otherwise affect normal operation of the control device.

[0034] The wireless transmitter 4 is used to wirelessly transmit control commands transmitted from the main control MCU3 to the lamplight main-control system 5, has an input terminal electrically connected to the main control MCU3, and is wirelessly connected to the lamplight main-control system 5.

[0035] The lamplight main-control system 5 is used to receive the control commands transmitted from the wireless transmitter 4 and to correspondingly control lamplight according to the control commands.

[0036] As shown in FIG. 1, the lamplight main-control system 5 includes a left lamplight control system 51 and a right lamplight control system 52, wherein the left lamplight control system 51 includes a left lamplight data processor 511, a left LED constant current source controller 512, and a left lamplight wireless receiver 513; the left lamplight data processor 511 is electrically connected to the left lamplight wireless receiver 513 and the left LED constant current source controller 512, and the left lamplight wireless receiver 513 is in wireless transmission connection with the wireless transmitter 4; the right lamplight control system 52 includes a right lamplight data processor 521, a right LED constant current source controller 522, and a right lamplight wireless receiver 523; and the right lamplight data processor 521 is electrically connected to the right lamplight wireless receiver 523 and the right LED constant current source controller 522, and the right lamplight wireless receiver 523 is in wireless transmission connection with the wireless transmitter 4.

[0037] When the car is driven at a place where light is insufficient, the ambient light intensity sensor 1 converts the light intensity induced by the ambient light intensity sensor 1 into the voltage signal; the main control MCU3 receives the voltage signal and converts the voltage signal into a digital signal (value), and then compares the digital signal with a light reference value preset by the users, and in this case, the digital signal is smaller than the light reference value; and afterwards, the main control MCU3 will transmit a control command to the lamplight main-control system 5 to control the lamplight main-control system 5 to turn on the car lamp.

[0038] When the car enters a tunnel, ambient light of the car is changed to be dim from being bright. After the car enters the tunnel in which street lamps are spaced apart from one another, the ambient light of the car is alternately changed between bright light and dim light; the ambient light intensity sensor 1 will induce a change law of the light intensity in this process and transmit the change law to the main control MCU3 in the form of a voltage signal; after receiving and analyzing the voltage signal of the change law, the main control MCU3 transmits a control command to the lamplight main-control system 5 to control the lamplight main-control system 5 to turn on the car lamp.

[0039] When being driven on a highway at a high speed at night, the speed sensor 2 detects speed data of the car, then the main control MCU3 reads the speed data and compares the speed data with a speed reference value present by the users, and in this case, the value of the speed data will be greater than the speed reference value; and afterwards, the main control MCU3 transmits a control command to the lamplight main-control system 5 to control the lamplight main-control system 5 to turn on a high beam.

[0040] When passing by other cars at night, the ambient light intensity will gradually become low, the main control MCU3 receives a light intensity change signal transmitted from the ambient light intensity sensor 1 and then transmits a control command to the lamplight main-control system 5 through the wireless transmitter 4 to control the lamplight main-control system 5 to switch the high beam to a low beam.

[0041] When the car is driven on an urban road after leaving from the highway, because street lamps on the highway and the urban road are spaced, the light intensity on the highway and the urban road is alternately changed between a high intensity and a low intensity; in this case, the main control MCU3 determines, by analysis, that the light intensity value in the light intensity signal transmitted from the ambient light intensity sensor 1 changes between a large value and a small value and that an average speed value transmitted from the speed sensor 2 is

changed to be small from being large; and then, the main control MCU3 transmits a control command to the lamplight main-control system 5 through the wireless transmitter 4 to control the lamplight main-control system 5 to switch the high beam to the low beam.

[0042] In a specific embodiment, the intelligent car lamplight control device further comprises a rain-fog detection sensor 6 used to automatically monitor the rain-fog state in an ambient environment and electrically connected to a digital input terminal of the main control MCU3, wherein two parallel and spaced metal sheets 61 are arranged on the rain-fog detection sensor 6; one metal sheet 61 is electrified, and when water is condensed between the two metal sheets 61, the two metal sheets 61 will be conductive with each other to cause a voltage change in the rain-fog detection sensor 6; the rain-fog detection sensor 6 can transmit a rain-fog state signal to the main control MCU3 after detecting the voltage change; and the main control MCU3 transmits a lamplight color switching control command to the lamplight main-control system 5 through the wireless transmitter 4 to control the lamplight main-control system 5 to switch white lamplight to yellow lamplight (turn on a fog lamp). Wherein, to make sure that the water can be condensed on the two metal sheets 61 and will not be blow away during driving, the two metal sheets 61 may be perpendicular to the driving direction of the car.

[0043] It should be noted that the intelligent car lamplight control device in the above embodiments of the present invention is only exemplified by dividing above function modules. In actual application, the above functions can be achieved by different function modules as required, that is, the internal structure of the system is divided into different function modules to achieve all or part of the functions described above.

[0044] In summary, the intelligent car lamplight control device can monitor the light intensity in the ambient environment of the car and the car speed in real time to correspondingly control the car lamp according to these state data, and can correctly use the high beam and the low beam to fulfill intelligent control over the car lamp, thus avoiding violations or traffic accidents caused by improper use of the lamp, and guaranteeing the safety and reliability.

[0045] Referring to FIG. 4, an embodiment of the utility model provides an intelligent car lamplight control device, which comprises a sensor acquisition module 1, and a car lamp control module 8 in wireless communication with the sensor acquisition module 7. All components of this embodiment are expounded below in conjunction with the accompanying drawings.

[0046] As shown in FIG. 5, the sensor acquisition module 7 includes a rain-fog detection sensor circuit 71, an ambient light intensity sensor circuit 72, a speed sensor circuit 73, a wireless transmitting circuit 74, and a data processing circuit 75 electrically connected to the rain-fog detection sensor circuit 71, the ambient light intensity sensor circuit 72, the speed sensor circuit 73, and the wireless transmitting circuit 74.

[0047] As shown in FIG. 6, an N8P054D MCU may be used as an MCU of the data processing circuit 75. The MCU of the data processing circuit 75 has an ambient light intensity AD analysis function, a light wave decoding data analysis function, a two-second delay timing function, a wireless data command encoding output function, a key setting function, a rain and fog state detection function, a car motion state data analysis function, a data and state storage function, and the like.

[0048] As shown in FIG. 7, a rain-fog detection sensor of the rain-fog detection sensor circuit 71 may include two parallel metal sheets SENSER spaced apart from each other by 1mm-2mm, wherein one metal sheet has a positive voltage applied thereto, and the other metal sheet is connected to the MCU of the data processing circuit 75. The metal sheets may have a thickness of 1mm and a length a 3mm and are fixed to specific positions of a car.

[0049] As shown in FIG. 8, a photosensitive diode D12 is used as a light intensity data acquisition device of the ambient light intensity sensor circuit 72; and when light changes, a light intensity induced by the photosensitive diode is converted into a variable voltage signal input to the MCU of the data processing circuit 75.

[0050] As shown in FIG. 9, the speed sensor circuit 73 is provided with a 3D acceleration sensor chip MC3232, and the MCU of the data processing circuit 75 can read data from the 3D acceleration sensor chip via a communication port thereof. The 3D acceleration sensor chip can acquire speed data and angular speed data.

[0051] As shown in FIG. 10, the wireless transmitting circuit 74 transmits data by means of a communication frequency band at a wireless common frequency of 315MHz-470MHz.

[0052] In addition, as shown in FIG. 5 and FIG. 11, the sensor acquisition module 7 may further include a first polarity protection circuit 76 and a first voltage stabilizing circuit 77 electrically connected to the first polarity protection circuit 76, wherein the first voltage stabilizing circuit 77 is electrically connected to and supplies power to the rain-fog detection sensor circuit 71, the ambient light intensity sensor circuit 72, the speed sensor circuit 73, the wireless transmitting circuit 74, and the data processing circuit 75. The first polarity protection circuit 76 allows a 12V-24V voltage to be accessed thereto. The first voltage stabilizing circuit 77 may be a 5V/1A DC-DC voltage stabilizing circuit.

[0053] As shown in FIG. 12 to FIG. 15, the car lamp control module 8 includes a yellow-white lamp PWM control circuit 81, a wireless receiving circuit 2, and a lamplight main-control circuit 83 electrically connected to the yellow-white lamp PWM control circuit 81 and the wireless receiving circuit 82.

[0054] A main control chip of the lamplight main-control circuit 83 has a wireless data decoding analysis function, a data storage and state memory function, a PWM control output function, a key setting function, an input voltage

detection function, and the like.

[0055] As shown in FIG. 12, FIG. 16, and FIG. 18, the car lamp control module 8 may further include a second polarity protection circuit 84 of 30V/4A, a second voltage stabilizing circuit 85 of 5V/1A, and a constant-current and constant-voltage circuit 86, wherein the second polarity protection circuit 84 is electrically connected to the second voltage stabilizing circuit 85 and the constant-current and constant-voltage circuit 86 of 9V/3A, the second voltage stabilizing circuit 85 is electrically connected to the wireless receiving circuit 82 and the lamplight main-control circuit 83, and the constant-current and constant-voltage circuit 86 is electrically connected to the yellow-white lamp PWM control circuit 81.

[0056] The operating principle of rain-fog direction and control is as follows:

When water is condensed on the two metal sheets, the voltage is transmitted from one metal sheet to the other metal sheet by means of the electrical conductivity of the water; when detecting the voltage, the rain-fog detection sensor circuit 71 transmits a signal to the MCU of the data processing circuit 75 for processing and then transmits the rain-fog state to the car lamp control module 8 every 20 seconds through the wireless transmitting circuit 74 by means of wireless encoding; and the yellow-white lamp PWM control circuit 81 switches white lamplight to yellow lamplight with higher power to penetrate through rain and fog.

[0057] 5 minutes after the voltage in the metal sheet disappears, the MCU of the data processing circuit 75 transmits the rain-fog state to the car lamp control module 8 through the wireless transmitting circuit, and the yellow-white lamp PWM control circuit 81 switches the yellow lamplight to the white lamplight to increase an irradiation distance.

[0058] The principle of the rain-fog direction lies in that the rain-fog state is captured by means of the electrical conductivity of the water. The metal sheets are parallel, and are perpendicular to a driving direction to make sure that the condensate water on the metal sheets will not be blow away immediately during driving, which may otherwise cause a misjudgment.

[0059] The rain and fog are determined by means of the electrical conductivity of the water, water condensation is guaranteed by the structural design of the parallel metal sheets, the rain-fog state and a sunny state are determined according to the on-off state of the metal sheets, and the color temperature of the lamplight is steplessly adjusted to 6500K from 2800K according to the rain-fog state.

[0060] The operating principle of light intensity detection and control is as follows:

The circuit provides a forward voltage for the photosensitive diode; when the light changes, the light intensity induced by the photosensitive diode is converted into the variable voltage signal input to an AD input port of the MCU of the data processing circuit 75 and then converted into a digital signal by the MCU, the MCU analyzes the state of ambient light through the acquired voltage signal and then transmits the state to the car lamp control module after encoding the state to be processed.

[0061] An ambient light processing method is as follows: the MCU determines the light state of an ambient environment during driving by means of data statistics and intelligent operations according to the signal acquired by the photosensitive diode.

[0062] For example, (1) after a car enters a tunnel in the daytime, bright light is changed to dim light; when lamplight irradiates in the tunnel, an alternate change between the bright light and the dim light is generated, so that the light state of an ambient environment can be determined according to change data; when the car enters the tunnel or light in the evening is lower than a certain value, the MCU provides data for the car lamp control module, and the car lamp control module controls a lamp control system to automatically turn on a lamp. (2) Light of spaced street lamps on a highway or an urban road is alternately changed between bright light and dim light, the MCU determines the light state of an ambient environment in cooperation with a speed sensor; after the car leaves from the highway, the ambient light intensity sensor circuit transmits a signal to the car lamp control module when detecting a street lamp, and the car lamp control module automatically switches a high beam to a lower beam. (3) A high beam is changed to be bright from being dim when an oncoming car appears; when detecting the oncoming car, the MCU transmits a data signal to the car lamp control module, and the car lamp control module changes the lamplight to the low beam to reduce the influence of long-range lamplight on drivers in passing-by cars, so that safe driving is achieved, and no influence will be caused to other car drivers.

[0063] Whether light, reflected by an ambient wall, of the car is reflected light or ambient light is distinguished through circuit cooperation to reduce misjudgements. Lamps of the car are controlled by a 5KHz PWM; and when the reflected light is transmitted to the photosensitive diode, the circuit can restore a signal of the 5KHz PWM to determine whether the reflected light is lamplight of the car or the ambient light.

[0064] The operating principle of speed detection and control is as follows:

The 3D acceleration sensor chip is used, the MCU of the data processing circuit 75 reads data from the 3D acceleration sensor chip via the 12C communication port thereof. The MCU works out the speed of car during driving, the speed of the car in a static state, or a road gradient by means of the data.

[0065] A driving speed or driving state is a necessary condition for turning on a car lamp. For example, when the car runs at a high speed over 60, a 3D acceleration sensor sends information to the car lamp control module, the yellow-white lamp PWM control circuit automatically switches the low beam to the high beam to increase a visual range to guarantee safe driving. In addition, in other embodiments, when the road gradient is greater than

15°, the yellow-white lamp PWM control circuit automatically adjusts a lamplight irradiation angle to make the road condition clear.

[0066] The above embodiments are only preferred ones of the present invention, and are not intended to limit the implementations of the present invention. All changes, modifications, substitutes, combinations, simplifications, and other equivalent transformations made without deviating from the spirit essence and principle of the present invention should also fall within the protection scope of the present invention.

Claims

1. An intelligent car lamplight control device, comprising:

an ambient light intensity sensor (1) used to automatically monitor a light intensity outside a car;
a speed sensor (2) used to detect a driving speed of the car;
a main control MCU (3) used to acquire a light intensity signal transmitted from the ambient light intensity sensor and a speed signal transmitted from the speed sensor, wherein when determining, by analysis, that a light intensity value in the light intensity signal transmitted from the ambient light intensity sensor is less than a preset value or is changed to be small from being large and then alternately changed between a large value and a small value, the main control MCU (3) transmits a car lamp on-off control command to a lamplight main-control system (5) through a wireless transmitter (4) to control the lamplight main-control system (5) to turn on a car lamp; when acquiring that a speed value in the speed signal transmitted from the speed sensor (2) is greater than a present value, the main control MCU (3) transmits a high/low beam switching control command to the lamplight main-control system (5) through the wireless transmitter (4) to control the lamplight main-control system (5) to switch a low beam to a high beam; and when determining, by analysis, that the light intensity value in the light intensity signal transmitted from the ambient light intensity sensor (1) is changed to be large from being small or is alternately changed between a large value and a small value and that an average driving speed is changed to be low from being high, the main control MCU (3) transmits a high/low beam switching control command to the lamplight main-control system (5) through the wireless transmitter (4) to control the lamplight main-control system (5) to switch the high beam to the low beam;
the wireless transmitter (4) used to wirelessly transmit the control commands transmitted from the main control MCU (3) to the lamplight main-control system (5); and
the lamplight main-control system (5) used to receive the control commands transmitted from the wireless transmitter (4) and to correspondingly control lamplight according to the control commands;
wherein, the main control MCU (3) has an analog input terminal electrically connected to the ambient light intensity sensor (1) as well as an 12C communication port electrically connected to the speed sensor (2), and the wireless transmitter (4) is electrically connected to the main control MCU (3) and is wirelessly connected to the lamplight main-control system (5).

2. The intelligent car lamplight control device according to Claim 1, wherein the ambient light intensity sensor (1) includes a photosensitive diode (11) capable of converting an induced light intensity into a voltage signal.

3. The intelligent car lamplight control device according to Claim 1, further comprising a rain-fog detection sensor (6) used to automatically monitor a rain-fog state in an ambient environment and electrically connected to a digital input terminal of the main control MCU (3), wherein two parallel and spaced metal sheets (61) are arranged on the rain-fog detection sensor (6); one said metal sheet is electrified, and when water is condensed between the two metal sheets, the two metal sheets will be conductive with each other to cause a voltage change in the rain-fog detection sensor (6); the rain-fog detection sensor (6) can transmit a rain-fog state signal to the main control MCU (3) after detecting the voltage change; and the main control MCU (3) transmits a lamplight color switching control command to the lamplight main-control system (5) through the wireless transmitter (4) to control the lamplight main-control system (5) to switch white lamplight to yellow lamplight.

4. The intelligent car lamplight control device according to Claim 1, wherein the speed sensor (2) includes a 3D acceleration sensor IC capable of detecting a gradient of a road where the car drives, and when determining, by analysis, that a gradient value of the driving road in a gradient signal transmitted from the speed sensor (2) is greater than a preset value, the main control MCU (3) transmits an angle adjustment control command to the lamplight main-control system (5) through the wireless transmitter (4) to control the lamplight main-control system (5) to adjust a lamplight irradiation angle.

5. The intelligent car lamplight control device according to Claim 1, wherein the wireless transmitter (4) trans-

mits data by means of a communication frequency band at a wireless common frequency of 315MHz-470MHz.

6. The intelligent car lamplight control device according to Claim 1, wherein the lamplight main-control system (5) includes a left lamplight control system (51) and a right lamplight control system (52) which are in wireless transmission connection with the wireless transmitter (4).

7. The intelligent car lamplight control device according to Claim 6, wherein the left lamplight control system (51) includes a left lamplight data processor (511), a left LED constant current source controller (512), and a left lamplight wireless receiver (513), wherein the left lamplight data processor (511) is electrically connected to the left lamplight wireless receiver (513) and the left LED constant current source controller (512), and the left lamplight wireless receiver (513) is in wireless transmission connection with the wireless transmitter (4).

8. The intelligent car lamplight control device according to Claim 6, wherein the right lamplight control system (52) includes a right lamplight data processor (521), a right LED constant current source controller (522), and a right lamplight wireless receiver (523), wherein the right lamplight data processor (521) is electrically connected to the right lamplight wireless receiver (523) and the right LED constant current source controller (522), and the right lamplight wireless receiver (523) is in wireless transmission connection with the wireless transmitter (4).

9. The intelligent car lamplight control device according to Claim 1, wherein the main control MCU (3) is able to simulate a light intensity value of the car lamp by means of a digital-to-analog conversion circuit arranged in the main control MCU and compare the light intensity value with the light intensity value in the light intensity signal transmitted from the ambient light intensity sensor (1).

10. An intelligent car lamplight control device, comprising a sensor acquisition module (7) and a car lamp control module (8) in wireless communication with the sensor acquisition module (7), wherein the sensor acquisition module (7) includes a rain-fog detection sensor circuit (71), an ambient light intensity sensor circuit (72), a speed sensor circuit (73), a wireless transmitting circuit (74), and a data processing circuit (75) electrically connected to the rain-fog detection sensor circuit (71), the ambient light intensity sensor circuit (72), the speed sensor circuit (73), and the wireless transmitting circuit (74); and the car lamp control module (8) includes a yellow-white lamp PWM control circuit (81), a wireless receiving circuit (82), and a lamplight main-control circuit (83) electrically connected to the yellow-white lamp PWM control circuit (81) and the wireless receiving circuit (82).

11. The intelligent car lamplight control device according to Claim 10, wherein a rain-fog detection sensor of the rain-fog detection sensor circuit (71) includes two parallel metal sheets spaced apart from each other by 1mm-2mm; and one said metal sheet has a positive voltage applied thereto, and the other metal sheet is connected to an MCU of the data processing circuit (75), in particular wherein the two metal sheets are perpendicular to a driving direction.

12. The intelligent car lamplight control device according to Claim 10, wherein a photosensitive diode is used as a light intensity data acquisition device of the ambient light intensity sensor circuit (72); and when light changes, a light intensity induced by the photosensitive diode is converted into a variable voltage signal input to an MCU of the data processing circuit (75).

13. The intelligent car lamplight control device according to Claim 10,
wherein the speed sensor circuit (73) is provided with a 3D acceleration sensor chip, and an MCU of the data processing circuit (75) reads data from the 3D acceleration sensor chip via a communication port of the MCU, or
wherein the wireless transmitting circuit (74) transmits data by means of a communication frequency band at a wireless common frequency of 315MHz-470MHz.

14. The intelligent car lamplight control device according to Claim 10, wherein the sensor acquisition module (7) further includes a first polarity protection circuit (76), and a first voltage stabilizing circuit (77) electrically connected to the first polarity protection circuit (76), the rain-fog detection sensor circuit (71), the ambient light intensity sensor circuit (72), the speed sensor circuit (73), the wireless transmitting circuit (74), and the data processing circuit (75).

15. The intelligent car lamplight control device according to Claim 10, wherein the car lamp control module (8) further includes a second polarity protection circuit (84), a second voltage stabilizing circuit (85), and a constant-current and constant-voltage circuit (86), wherein the second polarity protection circuit (84) is electrically connected to the second voltage stabilizing circuit (85) and the constant-current and constant-voltage circuit (86); the second voltage stabilizing circuit (85) is electrically connected to the wireless receiving circuit (82) and the lamplight main-control circuit (83); and the constant-current and constant-voltage circuit (86) is electrically connected to

the yellow-white lamp PWM control circuit (81).

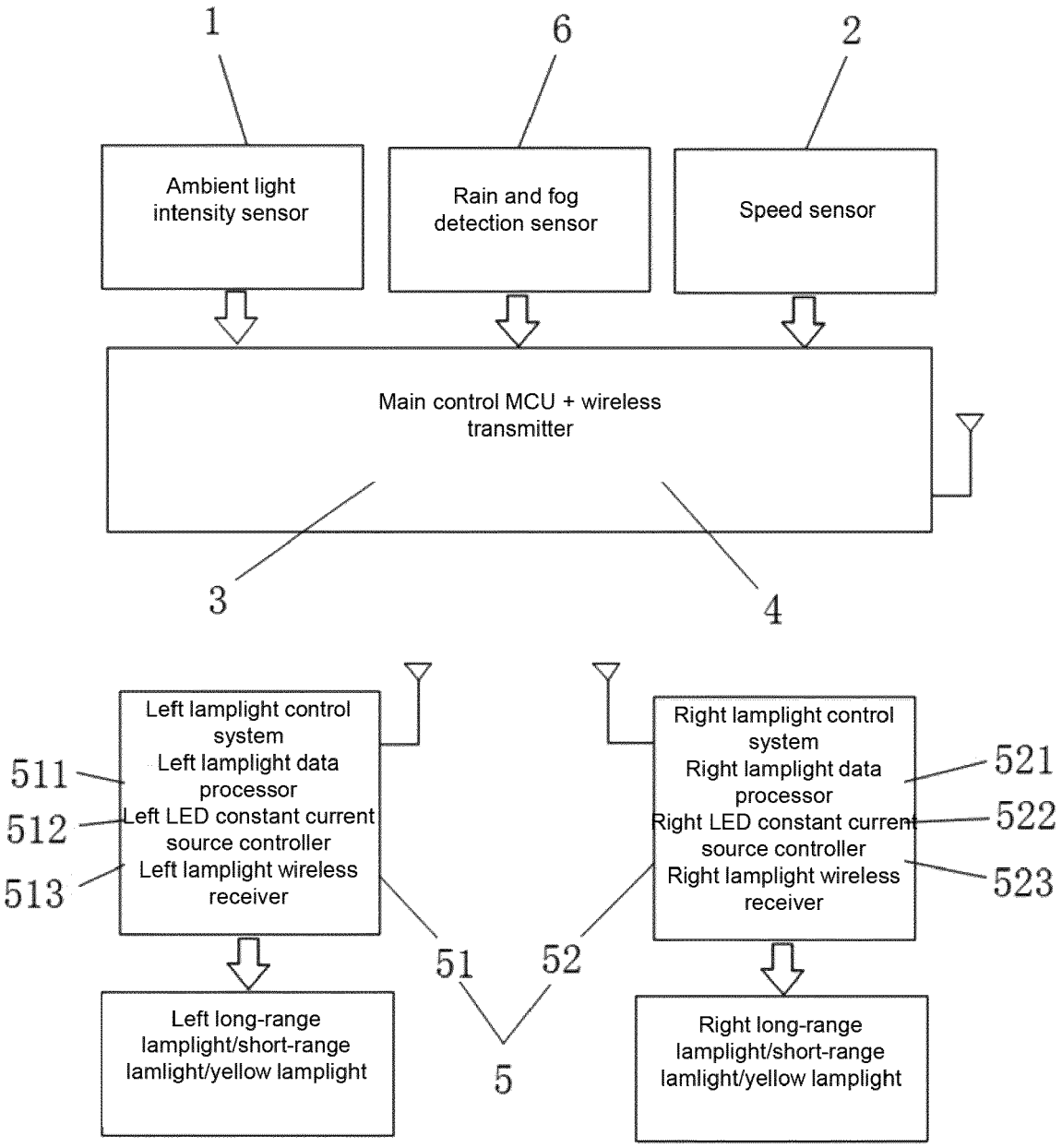

1
6
2
Ambient light intensity sensor
Rain and fog detection sensor
Speed sensor
Main control MCU + wireless transmitter
3
4
Left lamplight control system
Left lamplight data processor
Left LED constant current source controller
Left lamplight wireless receiver
511
512
513
Right lamplight control system
Right lamplight data processor
Right LED constant current source controller
Right lamplight wireless receiver
521
522
523
51
52
5
Left long-range lamplight/short-range lamlight/yellow lamplight
Right long-range lamplight/short-range lamlight/yellow lamplight

Fig.1

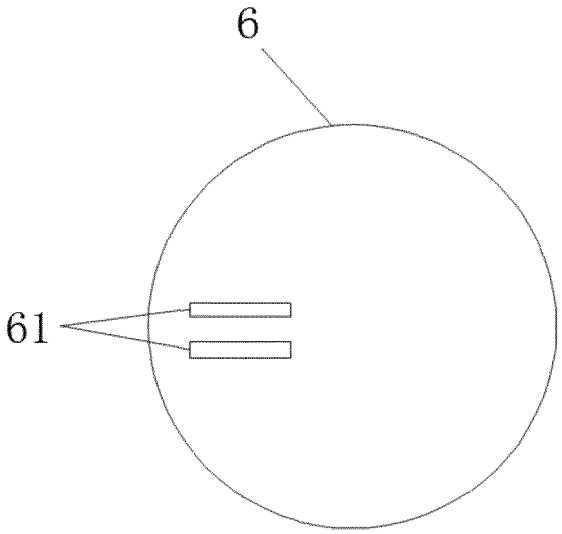


Fig.2

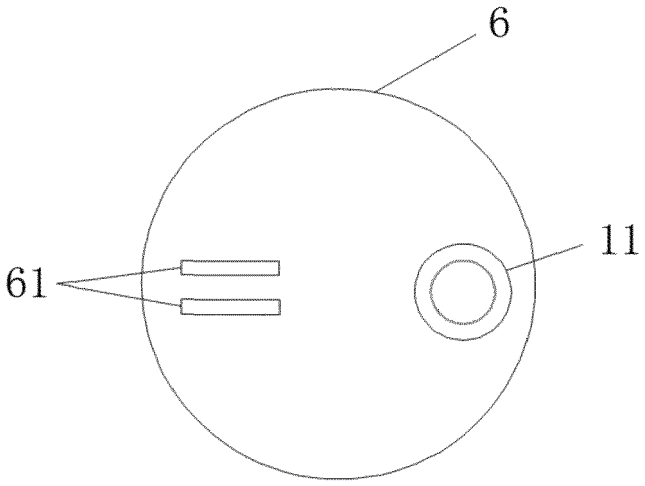


Fig.3

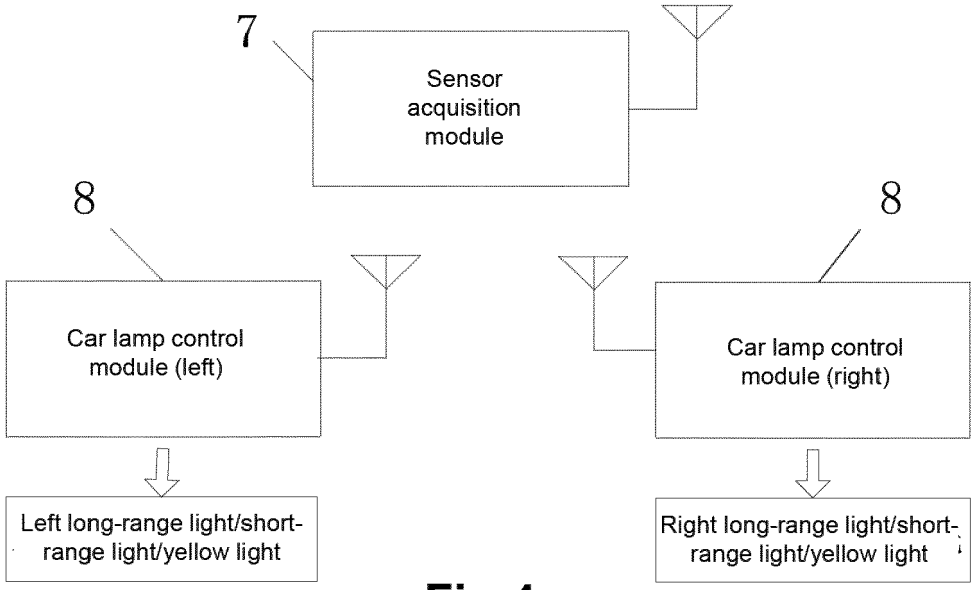

7
Sensor acquisition module
8
8
Car lamp control module (left)
Car lamp control module (right)
Left long-range light/short-range light/yellow light
Right long-range light/short-range light/yellow light

Fig.4

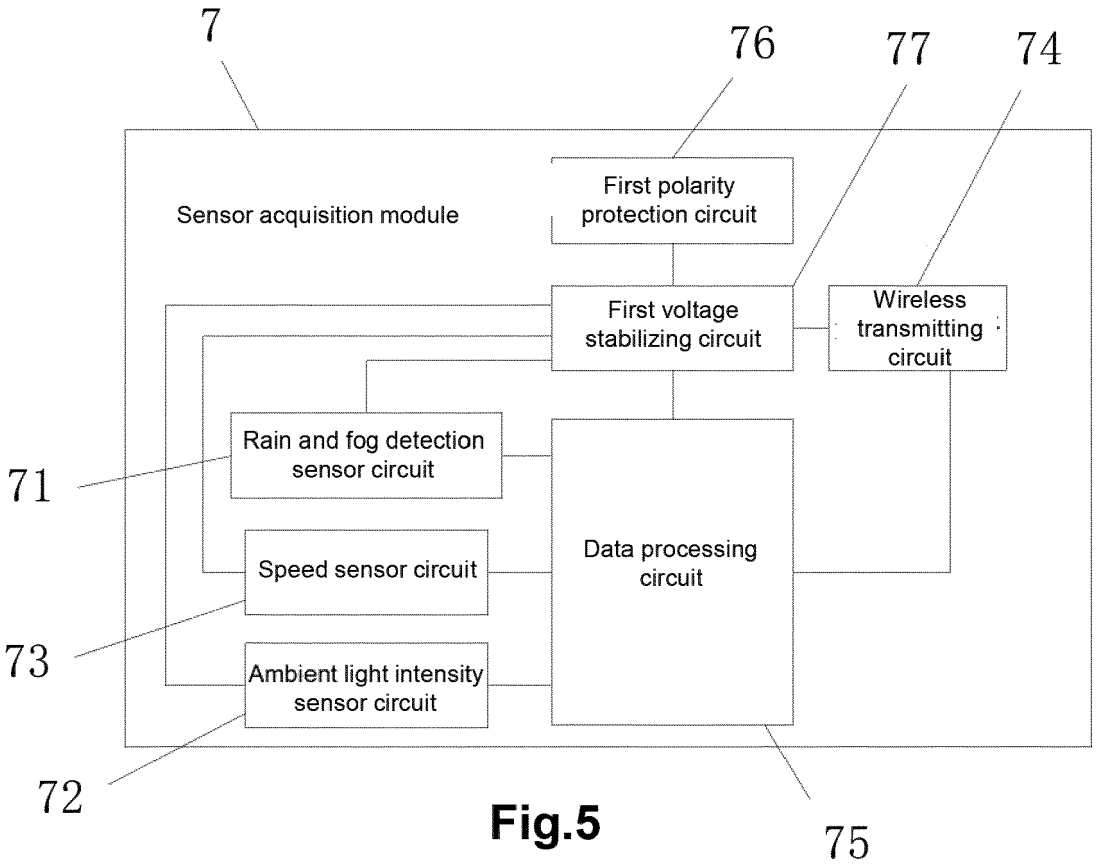

7
76
77
74
Sensor acquisition module
First polarity protection circuit
First voltage stabilizing circuit
Wireless transmitting circuit
Rain and fog detection sensor circuit
71
Speed sensor circuit
73
Ambient light intensity sensor circuit
72
Data processing circuit
75

Fig.5

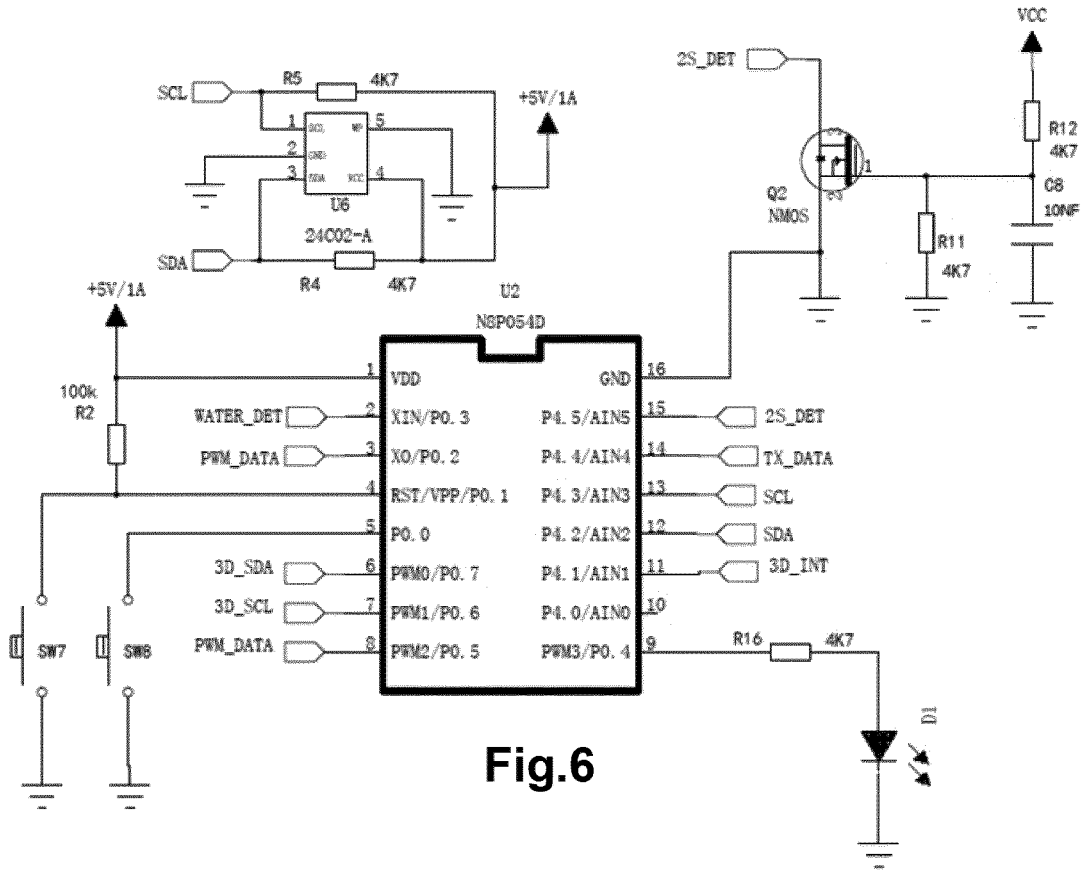

VCC
2S_DET
SCL
R5
4K7
+5V/1A
U6
24C02-A
SDA
R4
4K7
U2
N8P054D
R12
4K7
Q2
NMOS
C8
10NF
R11
4K7
+5V/1A
100k
R2
VDD
GND
WATER_DET
XIN/P0.3
P4.5/AIN5
2S_DET
PWM_DATA
XO/P0.2
P4.4/AIN4
TX_DATA
RST/VPP/P0.1
P4.3/AIN3
SCL
P0.0
P4.2/AIN2
SDA
3D_SDA
PWM0/P0.7
P4.1/AIN1
3D_INT
3D_SCL
PWM1/P0.6
P4.0/AIN0
PWM_DATA
PWM2/P0.5
PWM3/P0.4
R16
4K7
SW7
SW8
D1

Fig.6

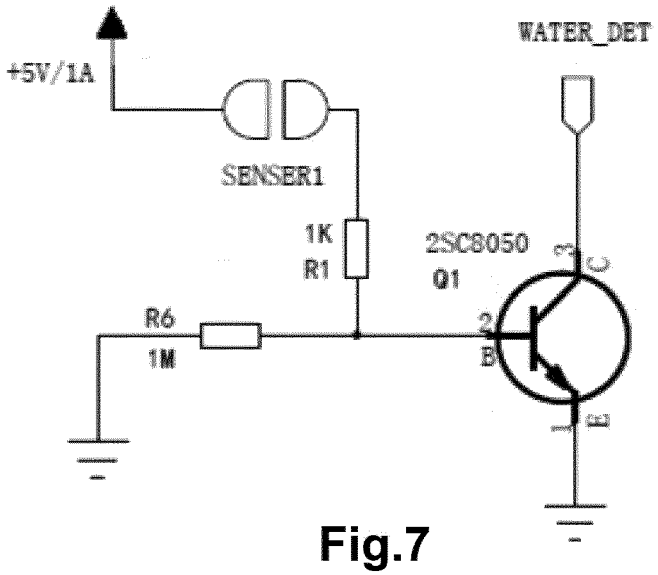

WATER_DET
+5V/1A
SENSER1
1K
R1
2SC8050
Q1
R6
1M
B

Fig.7

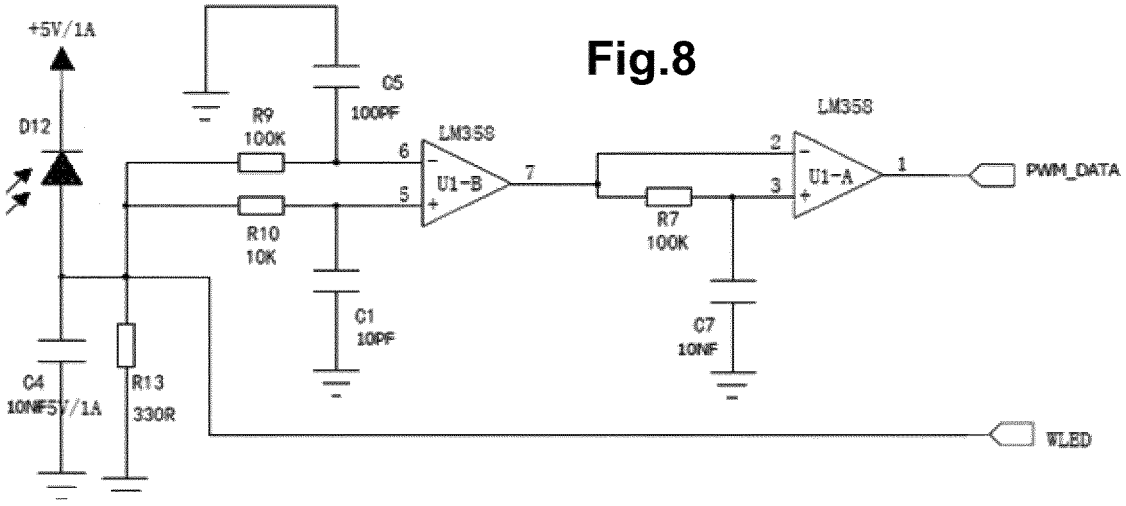


Fig.8

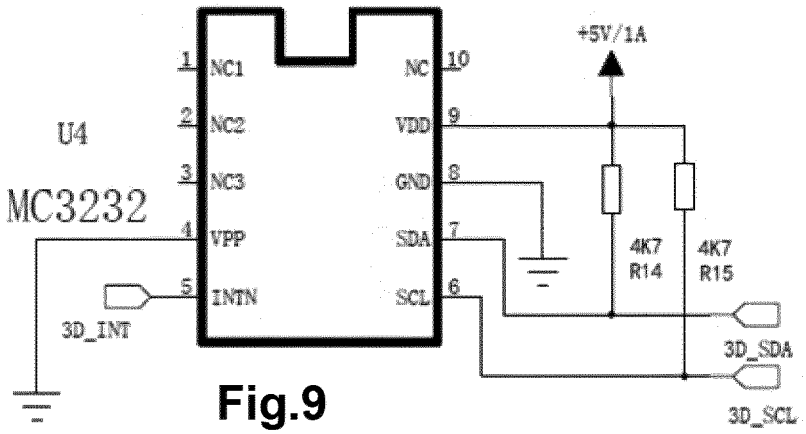


Fig.9

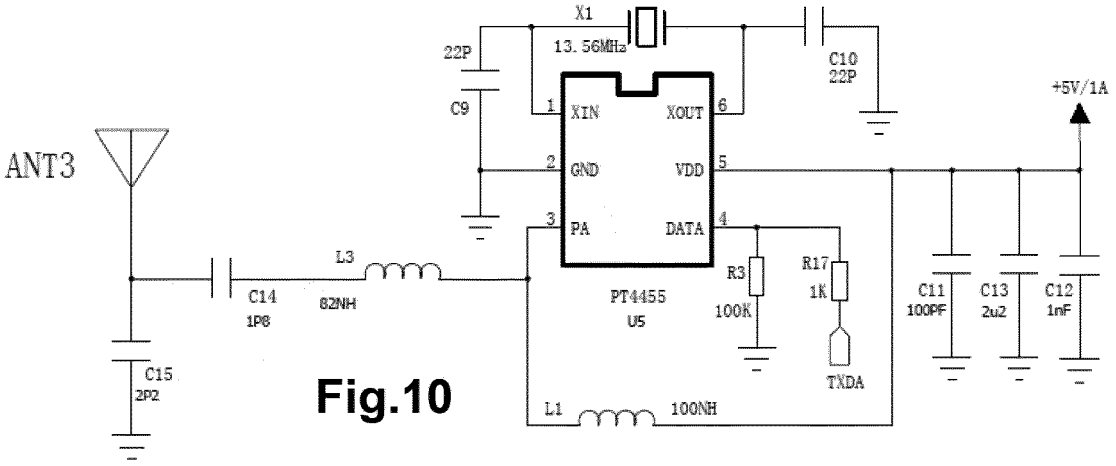


Fig.10

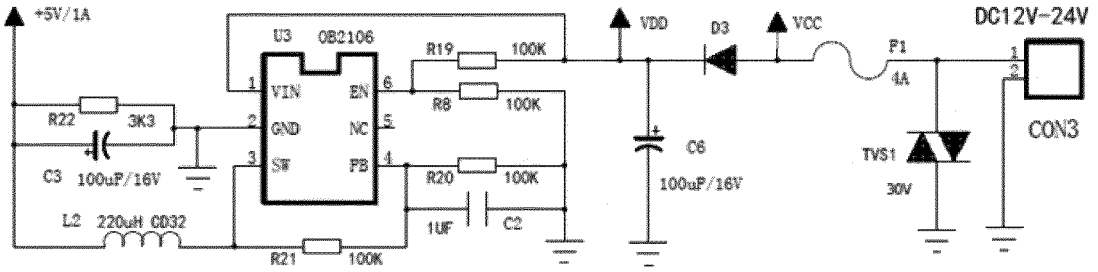


Fig.11

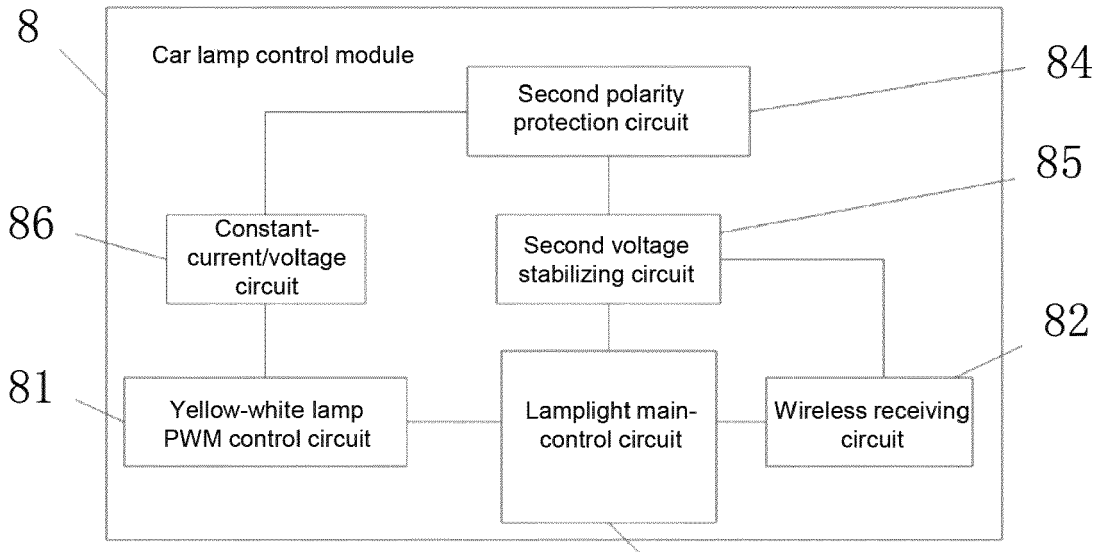


Fig.12

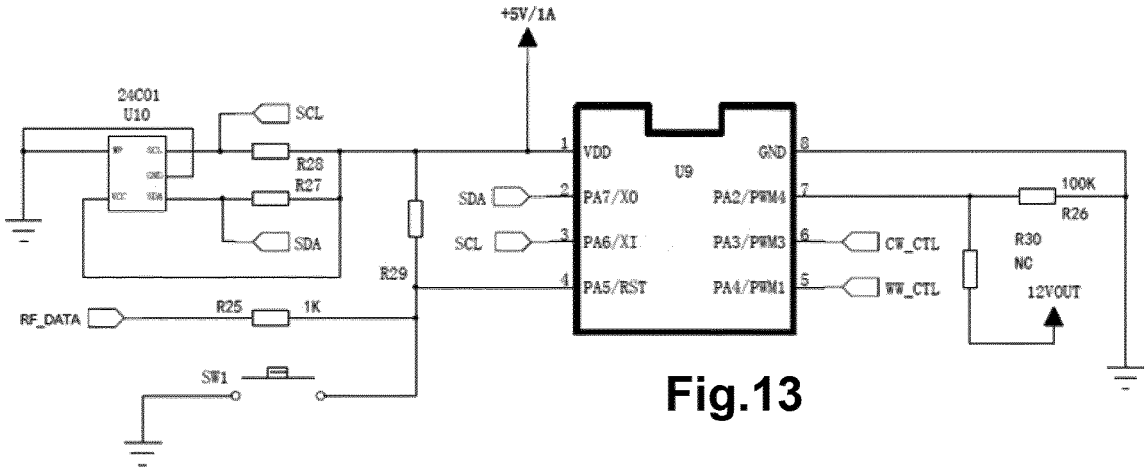


Fig.13

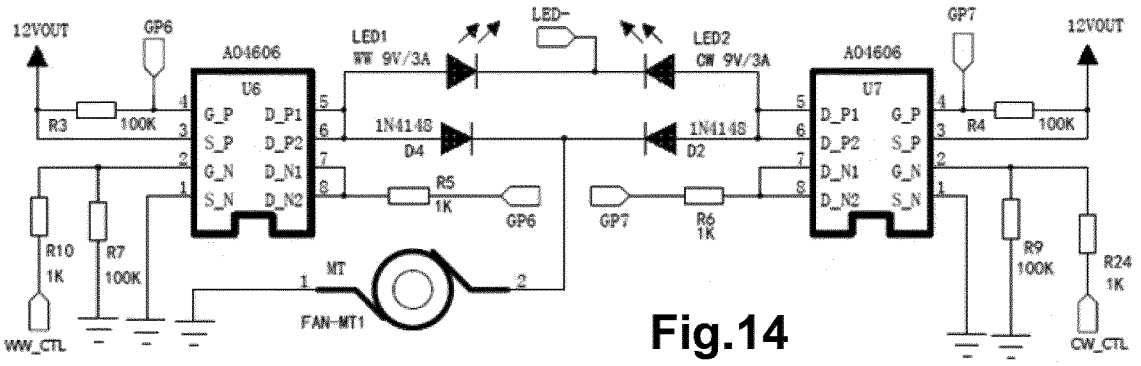


Fig.14

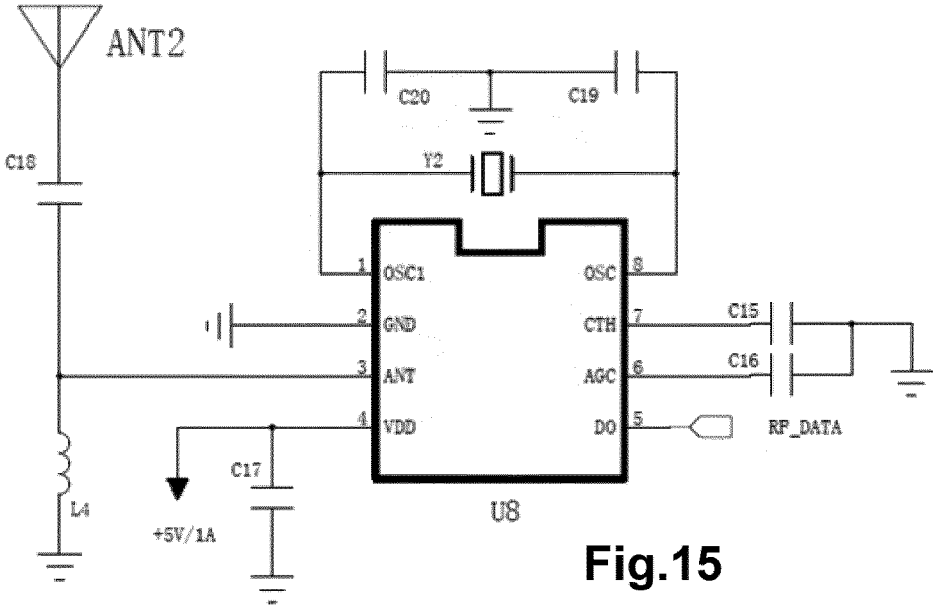


Fig.15

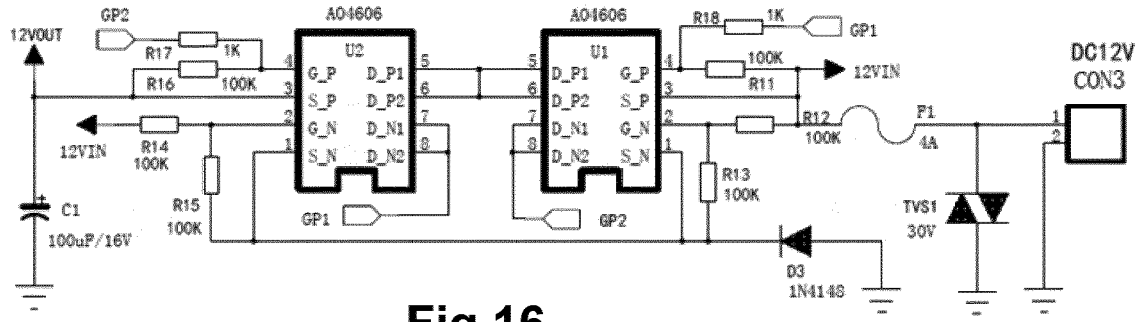
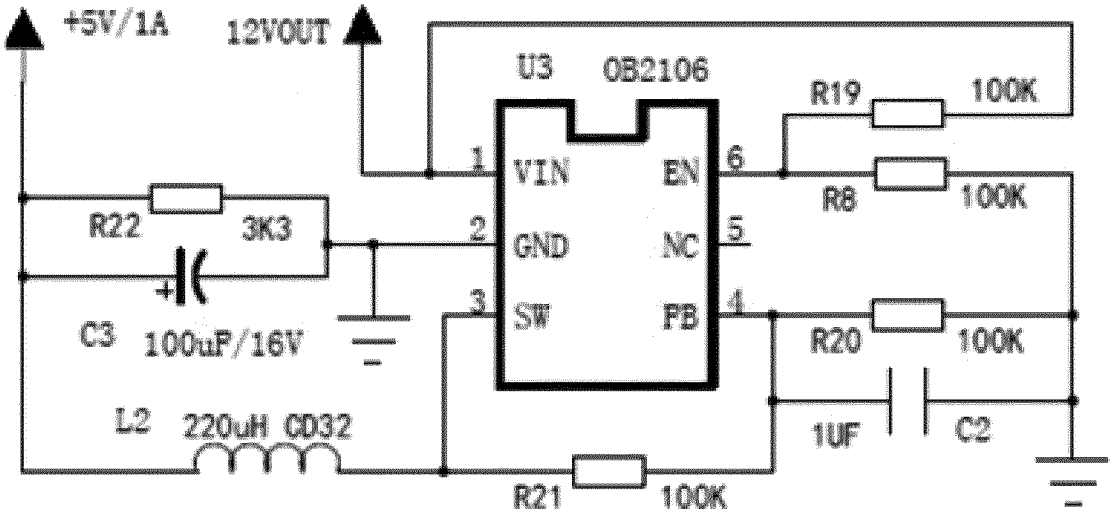


Fig.16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U3
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VIN
GND
SW
EN
NC
FB
R19
100K
R8
100K
R22
3K3
C3
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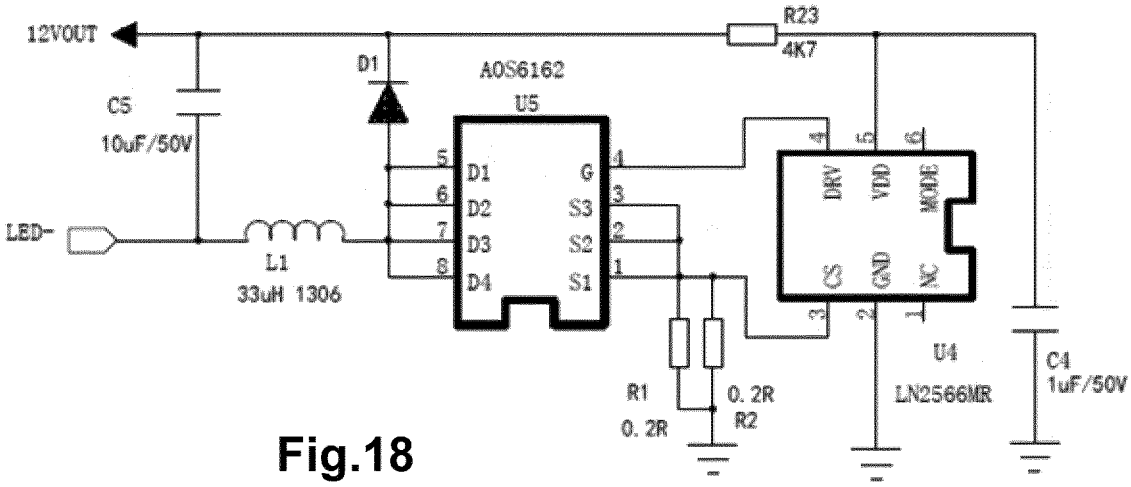
R20
100K
L2
220uH CD32
1UF
C2
R21
100K

Fig.17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R23
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D1
AOS6162
U5
C5
10uF/50V
LED-
L1
33uH 1306
D1
D2
D3
D4
G
S3
S2
S1
DRV
VDD
MODE
CS
GND
NC
U4
LN2566MR
R1
0.2R
0.2R
R2
C4
1uF/50V

Fig.18

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 5495

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2002/060522 A1 (STAM JOSEPH S [US] ET AL) 23 May 2002 (2002-05-23) * paragraphs [0016], [0136] - [0138]; figures 2-4, 6, 8 *	10-15	INV. H05B47/11 H05B47/105
Y	US 10 486 586 B1 (GHANNAM MAHMOUD YOUSEF [US] ET AL) 26 November 2019 (2019-11-26) * column 5, line 53 - column 6, line 45 *	10-15	
Y	US 2015/246634 A1 (HALL PHILIP B [US]) 3 September 2015 (2015-09-03) * paragraphs [0003], [0030] - [0032], [0033] - [0041]; figures 1-3 *	1-9	
Y	CN 108 189 750 A (HUNAN THREE DIMENSIONAL PRINTING SEIKO TECH CO LTD) 22 June 2018 (2018-06-22) * paragraph [0014] *	1-9	

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H05B
G06K
B60R
G01C
G06F
G06Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 March 2021	Hernandez Serna, J

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03-03-2021

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